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Skill comparison of probabilistic water level forecasts based on different ensemble weather prediction products

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For informed decision-making it is imperative that uncertainties in underlying information are adequately assessed if possible. The Bayesian Hydrological Uncertainty Processor (HUP) does so by updating prior water level distributions to arrive at a revised predictive posterior water level distribution. For that, it uses information on recent and current observed water levels and single-value forecasts for the near future.

The skill - and therefore value - of both 'prior' and 'posterior' is heavily dependent on the data that are used to derive these distributions. This is equally true for the 'likelihood' distribution employed in Bayesian updating, which expresses the distribution of water level forecasts conditional on level observations.

Likelihood distributions may be improved by using longer timeseries of water level forecasts (assuming that equally long timeseries of water level observations are available). In practise, the historical forecast archive is often relatively short compared to the available observations, also because past improvements in forecasting systems create inhomogeneous forecast series.

Recently, an ensemble version of the Bayesian HUP was suggested by Reggiani et al (2009). They determined the likelihood functions based on an available, three year long inhomogeneous archive of the 50 member ensemble ECMWF-EPS forecasts. Recently, ECMWF started systematically reforecasting precipitation using the current operational ECMWF model. The hindcast system consists of a 5-member ensemble, starting on the same day and month as the real-time forecast for each of the 18 years 1990-2007.

A comparison of forecast skill is made between the probabilistic forecasts made using the ensemble version of the HUP using the (1) likelihood functions based on the three-year long archive similar to Reggiani et al. (2009) and (2) likelihood functions derived with the 18-year ECMWF reforecasts ensemble. Comparison of forecast quality is done by using verification measures and associated skill scores for probabilistic forecasts of water levels.